

Chapter 1. General Introduction

INTRODUCTION

The South Bay Ocean Outfall (SBOO) discharges treated effluent to the Pacific Ocean that originates from 2 separate sources: the City of San Diego's South Bay Water Reclamation Plant (SBWRP) and the International Wastewater Treatment Plant (IWTP) operated by the International Boundary and Water Commission (IBWC). Wastewater discharge from the IWTP began on January 13, 1999 and is presently performed under the terms and conditions set forth in Order No. 96-50, Cease and Desist Order No. 96-52 for NPDES Permit No. CA0108928. Discharge from the SBWRP began on May 6, 2002 and was performed under Order No. 2000-129, NPDES Permit No. CA0109045 through December 31, 2006; this order has been replaced by Order No. R9-2006-0067 effective January 1, 2007. The Monitoring and Reporting Programs (MRPs) included in the above permits define the requirements for monitoring receiving waters in the region, including sampling plans, compliance criteria, laboratory analyses, and data analyses and reporting guidelines.

All receiving waters monitoring for the South Bay region with respect to the above referenced permits has been performed by the City of San Diego since discharge began in 1999. The City also conducted a baseline monitoring program for 3½-years before discharge began in order to characterize background environmental conditions for the SBOO region (City of San Diego 2000a). The results of this baseline study provide background information against which the post-discharge data may be compared. In addition, the City has conducted annual region-wide surveys off the coast of San Diego since 1994 either as part of regular South Bay monitoring requirements (e.g., City of San Diego 1998, 1999, 2000b, 2001, 2002, 2003, 2006) or as part of larger, multi-agency surveys of the entire Southern California Bight (e.g., Bergen et al. 1998, 2001, Noblet et al. 2002, Ranasinghe et al. 2003,

2007, Schiff et al. 2006). Such regional surveys are useful in characterizing the ecological health of diverse coastal areas and may help to identify and distinguish reference sites from those impacted by wastewater discharge, stormwater input or other sources of contamination.

Finally, the City of San Diego and the IBWC also contract with Ocean Imaging Corporation (Solana Beach, CA) to conduct a remote sensing program for the San Diego/Tijuana region as part of the ocean monitoring programs for the Point Loma and South Bay areas. Imagery from satellite data and aerial sensors produces a synoptic look at surface water clarity that is not possible using shipboard sampling alone. However, a major limitation of aerial and satellite images is that they only provide information about surface or near-surface waters (~0–15 m) without providing any direct information regarding the movement, color, or clarity of water in deeper layers. In spite of these limitations, one objective of this ongoing project is to ascertain relationships between the various types of imagery and data collected in the field. With public health issues being a paramount concern of ocean monitoring programs, any information that helps to provide a clearer and more complete picture of water conditions is beneficial to the general public as well as to program managers and researchers. Having access to a large-scale overview of surface waters within a few hours of image collection also has the potential to bring the monitoring program closer to real-time diagnosis of possible contamination conditions and add predictability to the impact that natural events such as storms and heavy rains may have on shoreline water quality.

This report presents the results of all receiving waters monitoring conducted as part of the South Bay monitoring program in 2006, including sampling at both regular fixed sites around the SBOO and randomly selected sites for the annual benthic survey of the entire San Diego region. The

results of the remote sensing surveys conducted during the year are also considered and integrated into interpretations of oceanographic and water quality data (e.g., bacteria levels, total suspended solids, oil and grease). Comparisons are also made to conditions present during previous years in order to evaluate any changes that may have occurred related to the outfall or natural events. The major components of the monitoring program are covered in the following chapters: Oceanographic Conditions, Microbiology, Sediment Characteristics, Macrobenthic Communities, Demersal Fishes and Megabenthic Invertebrates, Bioaccumulation of Contaminants in Fish Tissues, Regional Sediment Conditions, and Regional Macrobenthic Communities. Some general background information and procedures for the regular fixed-grid and regional monitoring programs and associated sampling designs are given below and in subsequent chapters and appendices.

REGULAR FIXED-GRID MONITORING

The South Bay Ocean Outfall is located just north of the border between the United States and Mexico. The outfall terminates approximately 5.6 km offshore at a depth of about 27 m. Unlike other southern California outfalls that are located on the surface of the seabed, the pipeline first begins as a tunnel on land and then continues under the seabed to a distance of about 4.3 km offshore. From there it connects to a vertical riser assembly that conveys effluent to a pipeline buried just beneath the surface of the seabed. This subsurface pipeline then splits into a Y-shaped multiport diffuser system, with the 2 diffuser legs extending an additional 0.6 km to the north and south. The outfall was originally designed to discharge and disperse effluent via a total of 165 diffuser risers, which included one riser located at the center of the “Y” and 82 others spaced along each diffuser leg. However, low flows have required closure of all ports along the northern diffuser leg and many along the southern diffuser since discharge began in order to maintain sufficient back pressure within the drop shaft so that the outfall can operate in accordance with the theoretical model.

Consequently, discharge during 2006 and previous years have been generally limited to the distal end of the southern diffuser leg, with the exception of a few intermediate points at or near the center of the diffusers.

The regular SBOO sampling area extends from the tip of Point Loma southward to Playa Blanca, Mexico, and from the shoreline seaward to a depth of about 61 m. The offshore monitoring stations are arranged in a fixed grid that spans the terminus of the outfall, with each site being monitored in accordance with NPDES permit requirements. Sampling at these fixed stations includes monthly seawater measurements of physical, chemical, and bacteriological parameters in order to document water quality conditions in the area. Benthic sediment samples are collected semiannually to monitor macrofaunal communities and sediment conditions. Trawl surveys are performed quarterly to monitor communities of demersal fish and large, bottom-dwelling invertebrates. Additionally, analyses of fish tissues are performed semiannually to monitor levels of chemical constituents that may have ecological or human health implications.

RANDOM SAMPLE REGIONAL SURVEYS

In addition to the regular fixed grid monitoring around the SBOO, the City typically conducts a summer benthic survey of sites distributed throughout the entire San Diego region as part of the monitoring requirements for the South Bay outfall. These annual surveys are based on an array of stations that are randomly selected by the United States Environmental Protection Agency (USEPA) using the probability-based EMAP design. Surveys conducted in 1994, 1998, and 2003 involved other major southern California dischargers, were broader in scope, and included sampling sites representing the entire Southern California Bight (SCB), from Cabo Colonet, Mexico to Point Conception, USA. These regional surveys were the Southern California Bight 1994 Pilot Project (SCBPP), and the Southern California Bight 1998 and 2003 Regional Monitoring Programs (Bight'98 and Bight'03,

respectively). Results of these 3 bightwide surveys are available in Bergen et al. (1998, 2001), Noblet et al. (2002), Ranasinghe et al. (2003, 2007), and Schiff et al. (2006). A separate regional survey was not conducted in 2004 in order to conduct a special “sediment mapping” study pursuant to an agreement with the San Diego Regional Water Quality Control Board and USEPA (see Stebbins et al. 2004, City of San Diego 2005).

The 2006 summer survey of randomly selected sites off San Diego covered an area from Del Mar south to the Mexican border and extending offshore from depths of 12 m to about 197 m. This survey revisited the same randomly selected sites targeted in 1996 (see City of San Diego 1998). Although 40 sites were targeted each year, only 34 were successfully sampled for benthic infauna and sediments in 2006 compared to 33 originally in 1996. Unsuccessful sampling was due to the presence of rocky substrates that made it impossible to collect benthic grab samples.

LITERATURE CITED

- Bergen, M., S.B. Weisberg, D. Cadien, A. Dalkey, D. Montagne, R.W. Smith, J.K. Stull, and R.G. Velarde. (1998). Southern California Bight 1994 Pilot Project: IV. Benthic Infauna. Southern California Coastal Water Research Project, Westminster, CA.
- Bergen, M., S.B. Weisberg, R.W. Smith, D.B. Cadien, A. Dalkey, D.E. Montagne, J.K. Stull, R.G. Velarde, and J.A. Ranasinghe. (2001). Relationship between depth, sediment, latitude, and the structure of benthic infaunal assemblages on the mainland shelf of southern California. *Mar. Biol.*, 138: 637–647.
- City of San Diego. (1998). San Diego Regional Monitoring Report for 1994–1996. City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- City of San Diego. (1999). San Diego Regional Monitoring Report for 1994–1997. City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- City of San Diego. (2000a). International Wastewater Treatment Plant Final Baseline Ocean Monitoring Report for the South Bay Ocean Outfall (1995–1998). City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- City of San Diego. (2000b). Annual Receiving Waters Monitoring Report for the South Bay Ocean Outfall (1999). City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- City of San Diego. (2001). Annual Receiving Waters Monitoring Report for the South Bay Ocean Outfall (2000). City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- City of San Diego. (2002). Annual Receiving Waters Monitoring Report for the South Bay Ocean Outfall (2001). City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- City of San Diego. (2003). Annual Receiving Waters Monitoring Report for the South Bay Ocean Outfall (2002). City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.

- City of San Diego. (2005). Annual Receiving Waters Monitoring Report for the South Bay Ocean Outfall (International Wastewater Treatment Plant), 2004. City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- City of San Diego. (2006). Annual Receiving Waters Monitoring Report for the South Bay Ocean Outfall (International Wastewater Treatment Plant), 2005. City of San Diego Ocean Monitoring Program, Metropolitan Wastewater Department, Environmental Monitoring and Technical Services Division, San Diego, CA.
- Noblet, J.A., E.Y. Zeng, R. Baird, R.W. Gossett, R.J. Ozretich, and C.R. Phillips. (2002). Southern California Bight 1998 Regional Monitoring Program: VI. Sediment Chemistry. Southern California Coastal Water Research Project, Westminster, CA.
- Ranasinghe, J.A., D.E. Montagne, R.W. Smith, T. K. Mikel, S.B. Weisberg, D. Cadien, R. Velarde, and A. Dalkey. (2003). Southern California Bight 1998 Regional Monitoring Program: VII. Benthic Macrofauna. Southern California Coastal Water Research Project. Westminster, CA. 91 p + 9 Appendices.
- Ranasinghe, J.A., A.M. Barnett, K. Schiff, D.E. Montagne, C. Brantley, C. Beegan, D.B. Cadien, C. Cash, G.B. Deets, D.R. Diener, T.K. Mikel, R.W. Smith, R.G. Velarde, S.D. Watts, and S.B. Weisberg. (2007). Southern California Bight 2003 Regional Monitoring Program: III. Benthic Macrofauna. Southern California Coastal Water Research Project. Costa Mesa, CA.
- Schiff, K., K. Maruya, and K. Christenson. (2006). Southern California Bight 2003 Regional Monitoring Program: II. Sediment Chemistry. Southern California Coastal Water Research Project, Westminster, CA.
- Stebbins, T.D., K.C. Schiff, and K. Ritter. (2004). San Diego Sediment Mapping Study: Workplan for Generating Scientifically Defensible Maps of Sediment Condition in the San Diego Region. 11 pp.